



# **NOvA Update**

**MINOS Collaboration Meeting**  
**Tufts University**  
**5 June 2006**

**Gary Feldman**



# Developments

- **The NOvA CD-1 review went extremely well. There were no changes to our budget or schedule and there was a unanimous recommendation to grant CD-1.**
- **We are on track for a CD-2 review in the fall or early winter.**
- **The DOE has developed a method of getting around its own rules on Congressional line items.**
  - **The far detector building to be constructed on a “cooperative agreement.”**
  - **The NOvA detectors will be built as an MIE (major item of equipment).**



# Developments

- **We are getting good support from the DOE. We have received a funding profile from the DOE for \$200 M, exclusive of R&D to be used for CD-2.**
- **We had a constructive meeting with Robin Staffin at the Fermilab Users' Meeting last week. He expressed support and recommended that we size the far detector building for 25 kT to allow for use of earned contingency and foreign contributions, but only plan on around \$200 M for CD-2.**



# Developments

- **The NOvA collaboration met two weeks ago in International Falls.**
  - We had a successful open house for the community, which was attended by about 50 locals.
  - The general reaction was “What can we do to help you?”



# Developments

- **We expect strong support from P5.**
  - I have spoken with Abe Seiden and I believe that he understands the importance of NOvA for the world-wide neutrino program and for any future US accelerator-based neutrino program.
  - We are currently preparing answers to a few questions from P5 and will have a phone meeting with the neutrino subcommittee of P5 later this week.



# Developments

- We have not been helped by the EPP2010 report, and more specifically by Harold Shapiro's talks on the report.
- Five Italian groups are ready to join NOvA, but due to concerns over the EPP2010 report, the INFN is delaying action until P5 reports.
- There does, however, appear to be a good line of communication between the DOE and INFN.



# Developments

- **We are continuing to work on reducing costs.**
- **We will probably only have two module factories instead of three.**
- **Based on a visit to Kuraray, we expect a price reduction for fiber. The previous quote we had from them was based on a misunderstanding.**
- **If we can reduce the building overburden, we can reduce the cost of building substantially.**



# Developments

- **We are getting strong support from the Fermilab management. Pier is fully aware of the importance of NOvA to Fermilab's future.**
- **Even with the pressure to downscope, we maintain a strong physics case due to the lab's new proton plan, which uses both the Accumulator and Recycler to store Booster batches and hide the Booster filling time from the Main Injector.**
- **Work underway to improve our reconstruction will further strengthen the physics case.**





# Proton Plan

- **The Proton Plan schedule:**
  - **FY2010: Full year down period to convert the Main Injector to a 1 MW proton source**
    - **Conversion of the Recycler and Accumulator into proton stackers**
    - **Construction of Booster-Accumulator and Accumulator-Recycler transfer lines**
    - **Main Injector rf upgrade**
    - **NuMI target upgrade**
  - **FY2011: 44 weeks of running; 400 kW to 700 kW**
  - **FY2012: 38 weeks of running; 700 kW to 1 MW**
  - **FY2013 and beyond: 44 weeks of running at 1 MW**



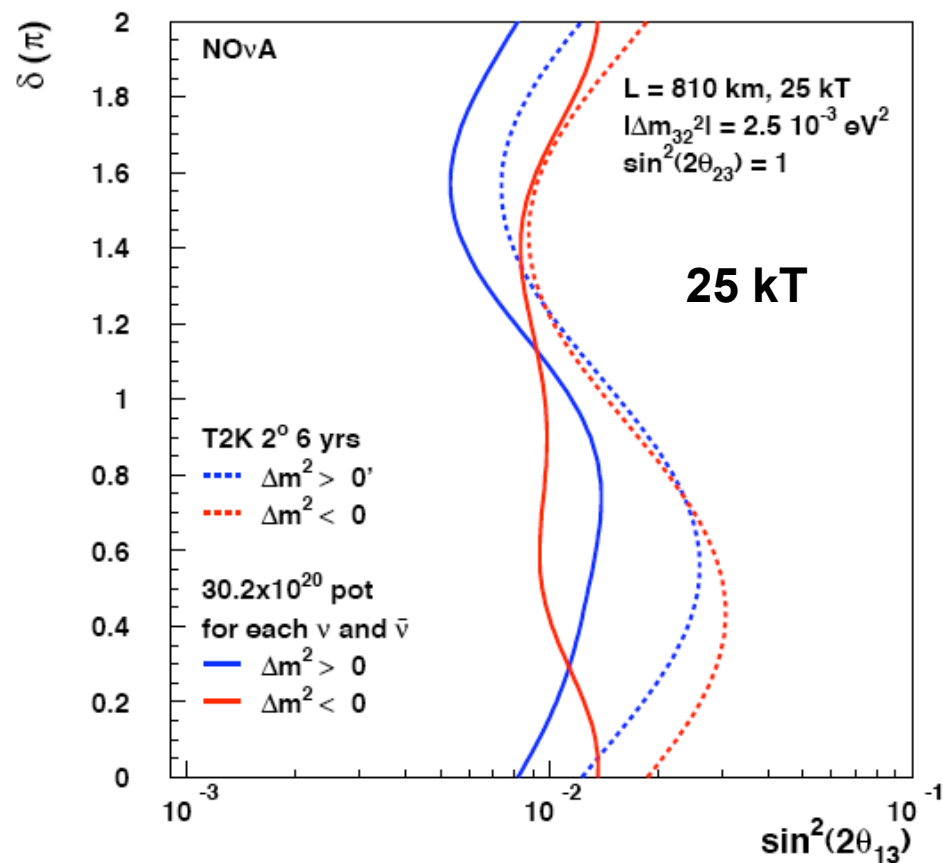
# Proton Plan

- **Degradation factors assumed:**
  - Accelerator uptime: 85%
  - Average to peak: 90%
  - NuMI uptime: 90%
  - $\Rightarrow$  overall efficiency: 69%
- **Assumed that NOvA would begin running when 5 kT had been commissioned and would run for 6 years from the end of construction, giving a total of  $60.3 \cdot 10^{20}$  pot.**

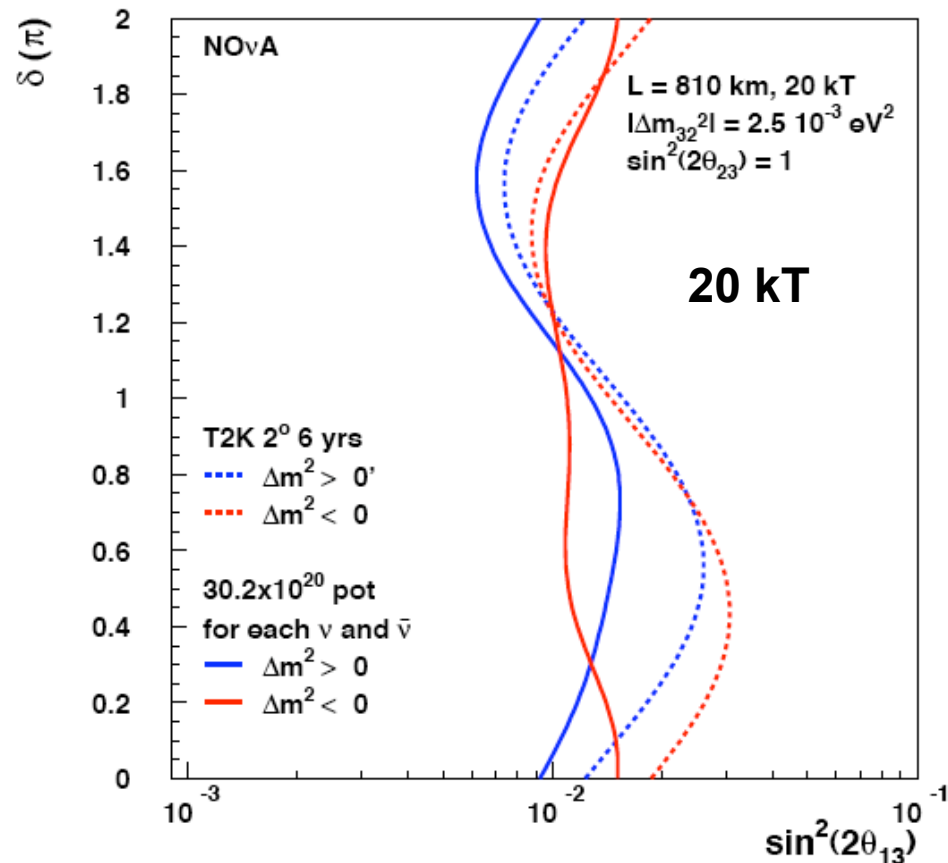


# Comparison of 25 kT and 20 kT

3  $\sigma$  Sensitivity to  $\sin^2(2\theta_{13}) \neq 0$



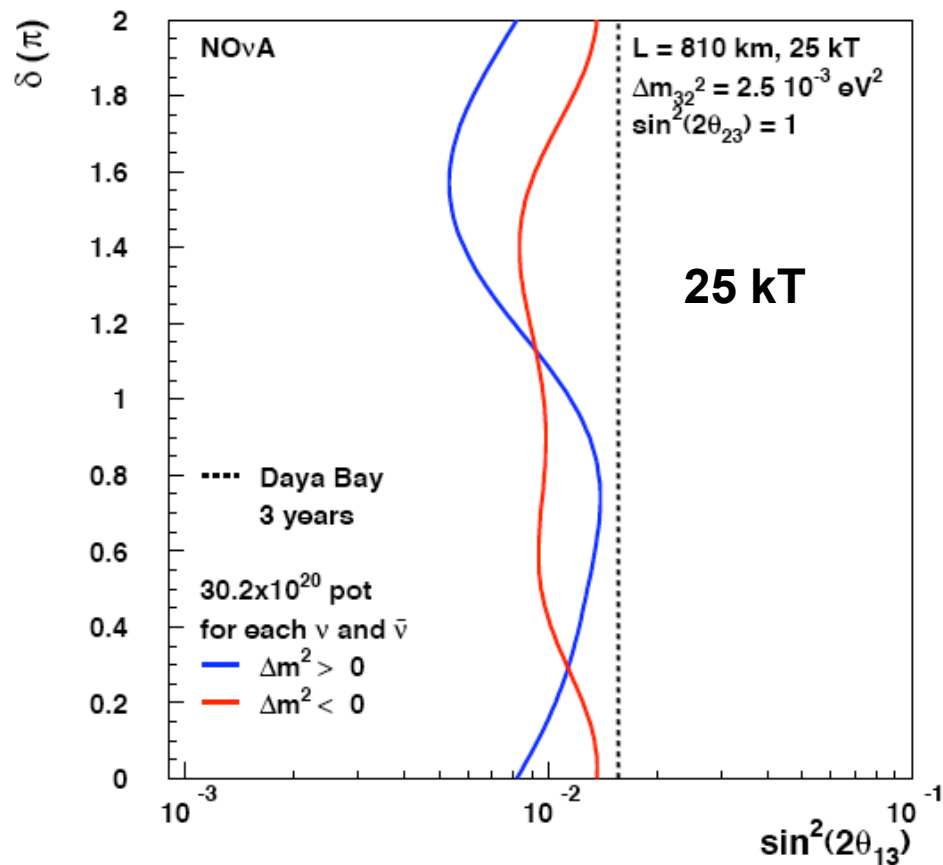
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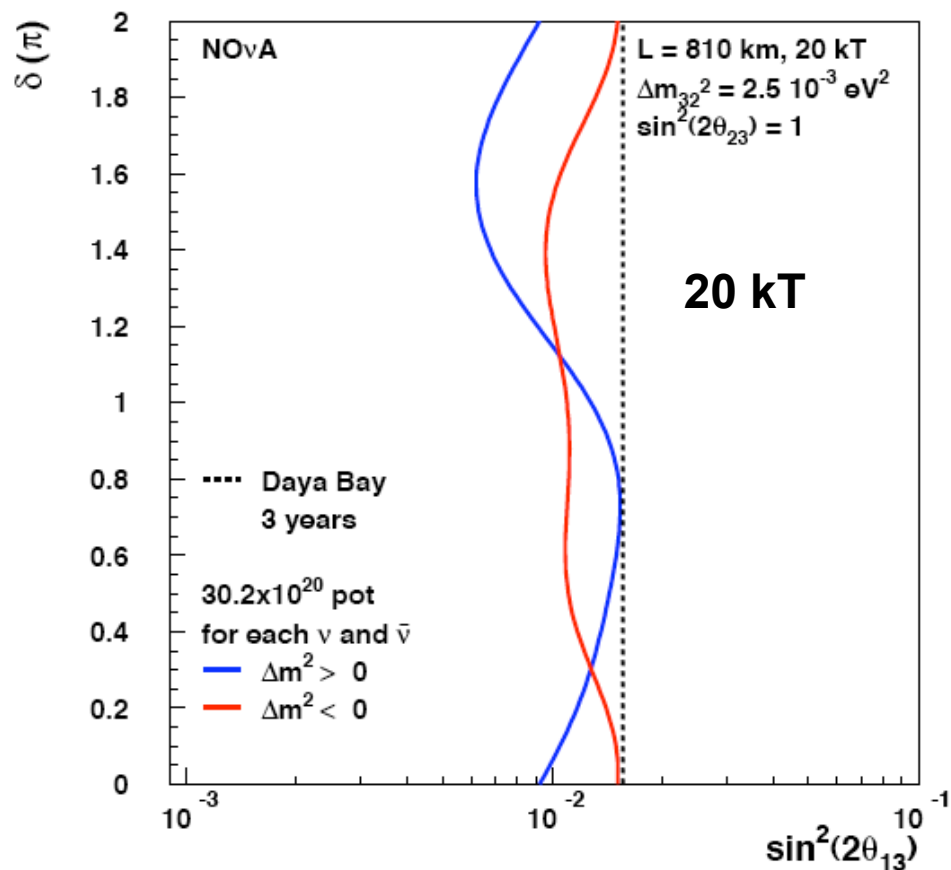


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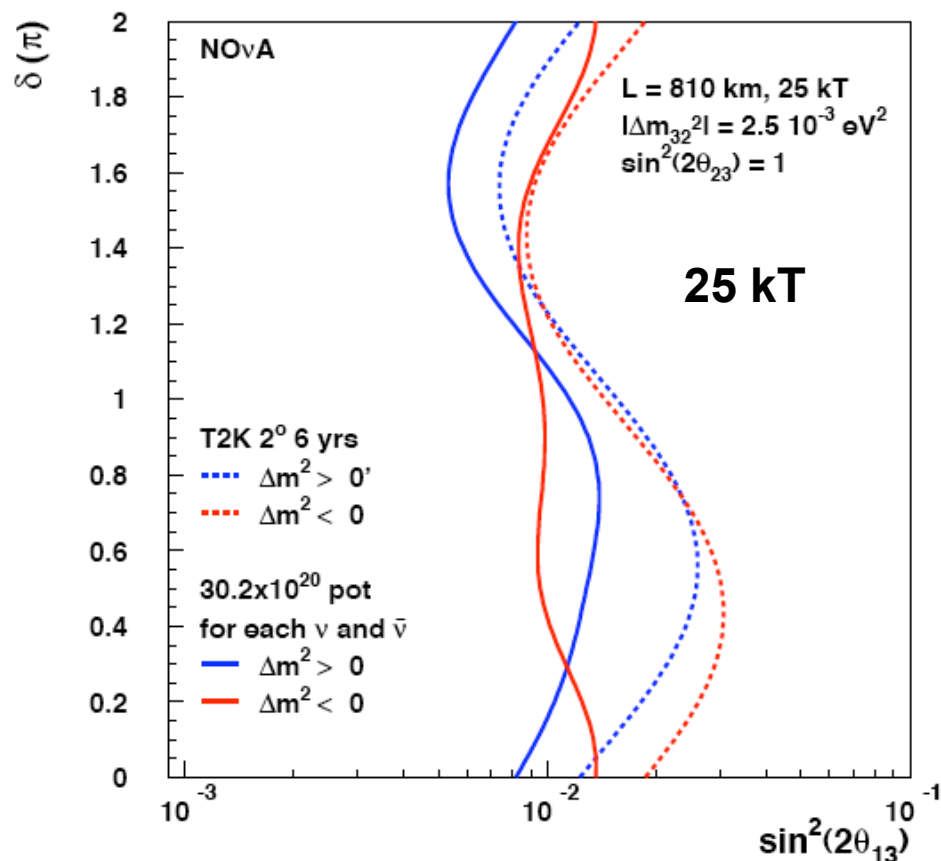
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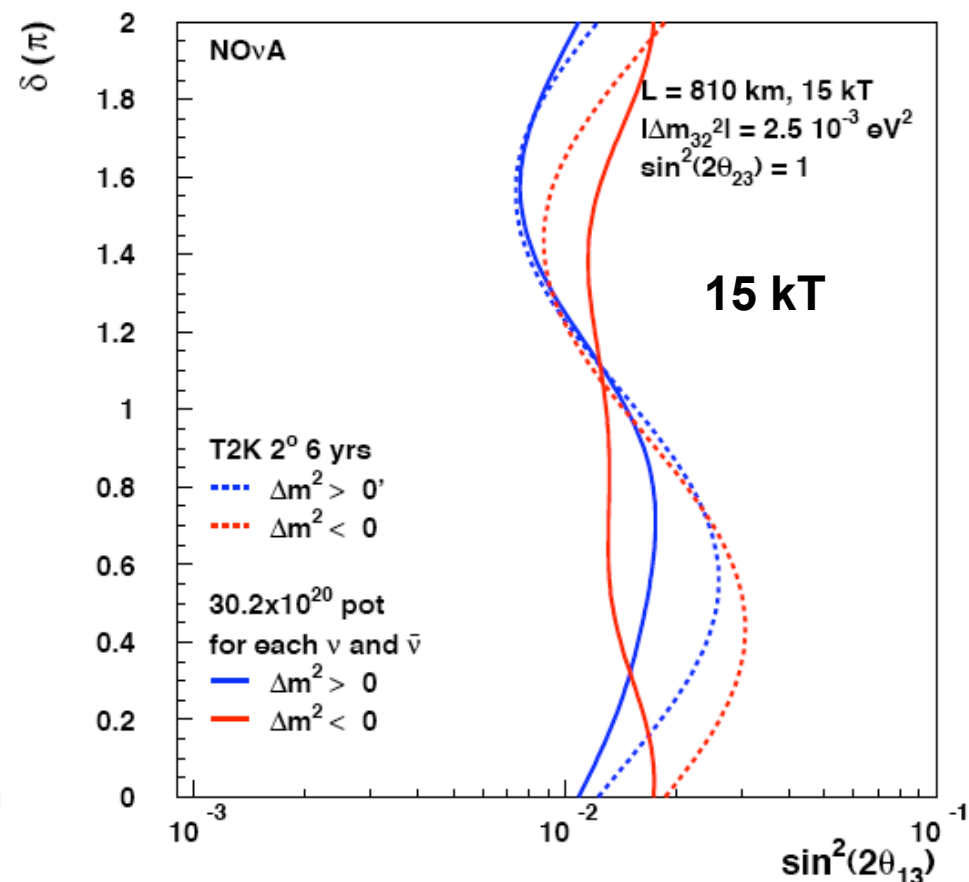


# Comparison of 25 kT and 15 kT

3  $\sigma$  Sensitivity to  $\sin^2(2\theta_{13}) \neq 0$



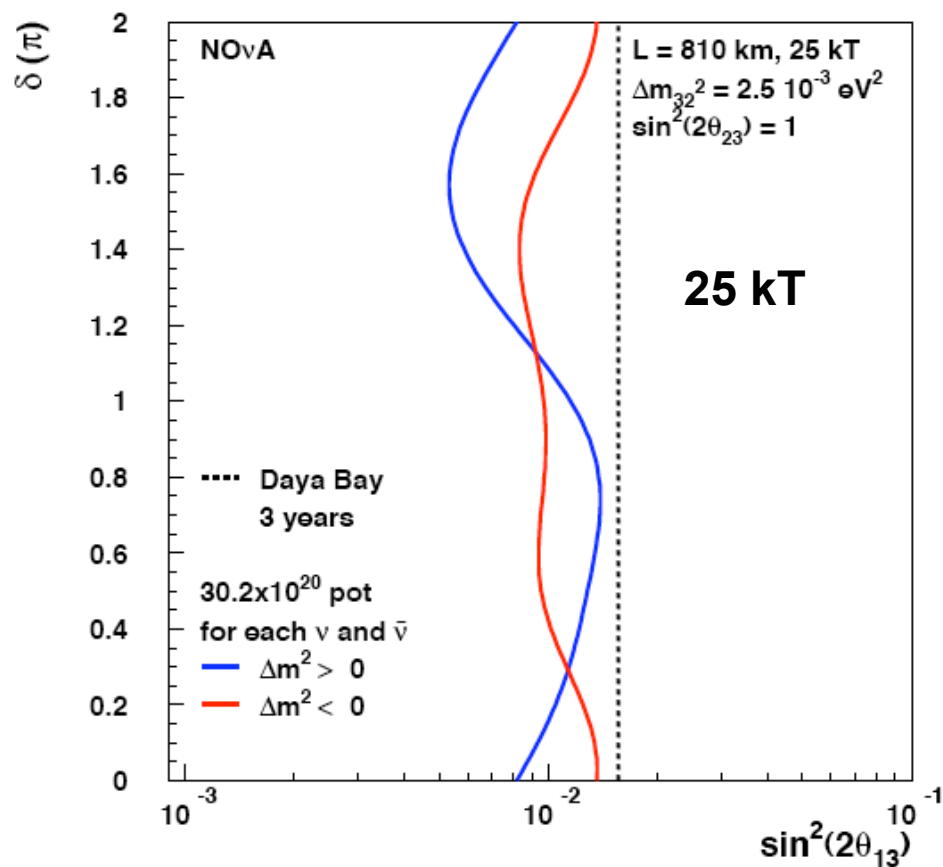
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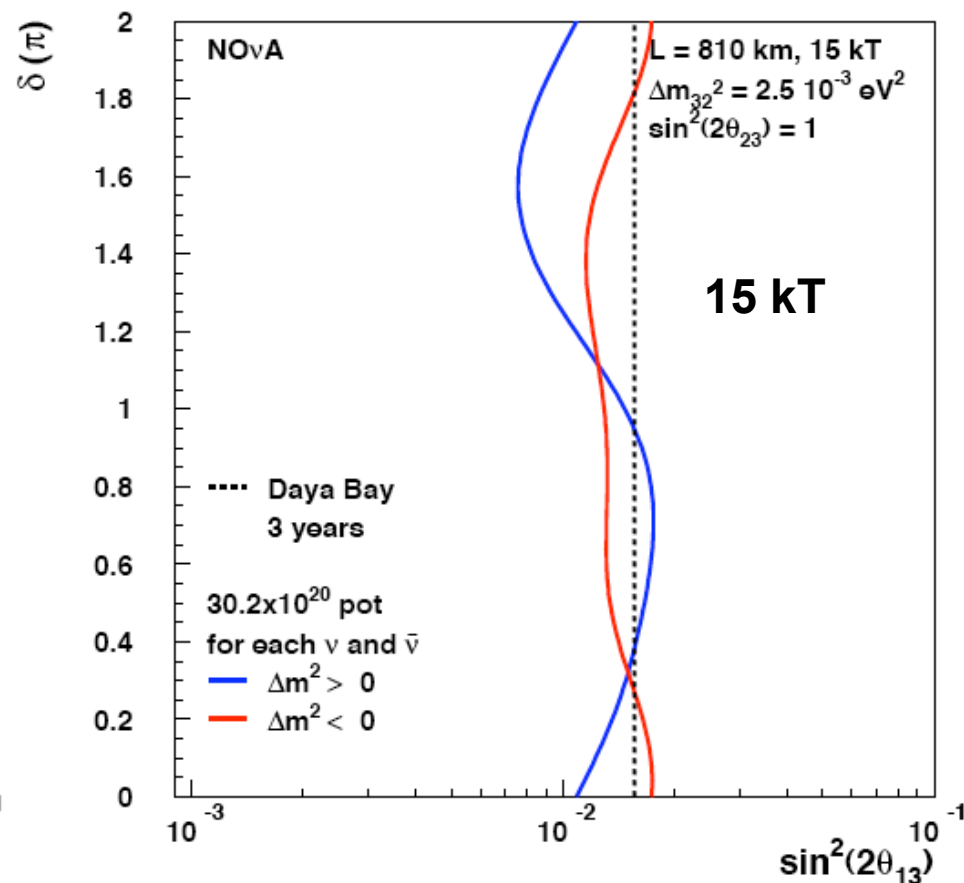


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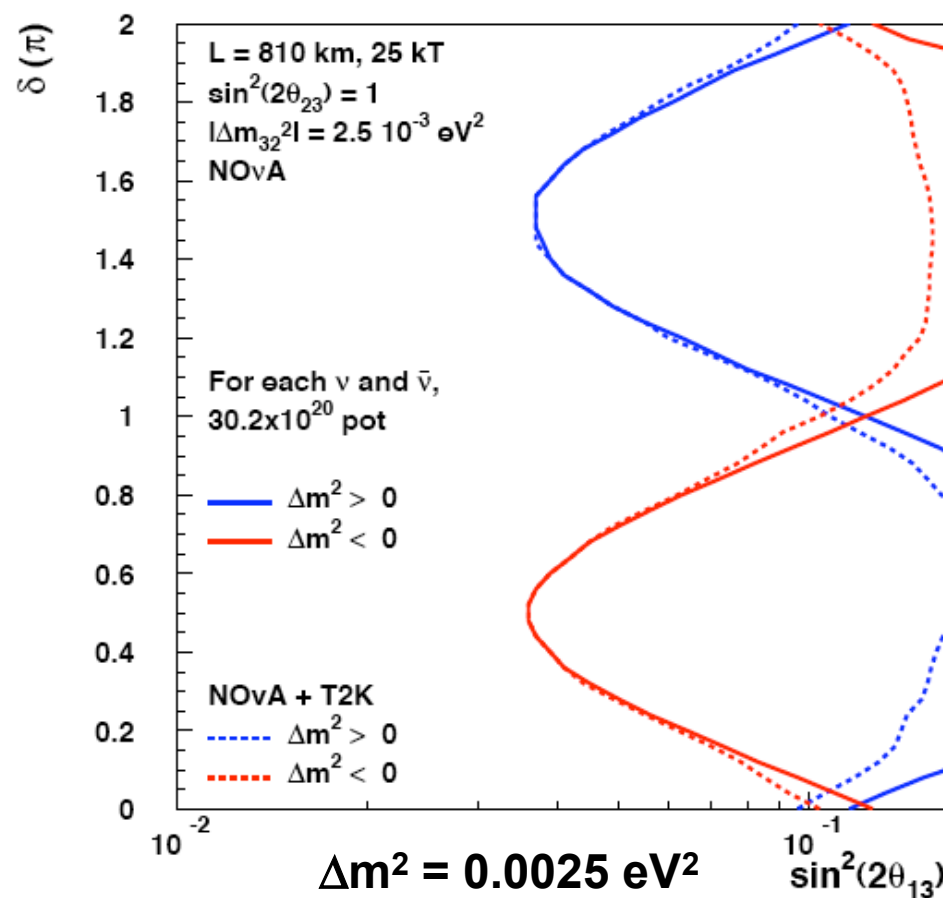
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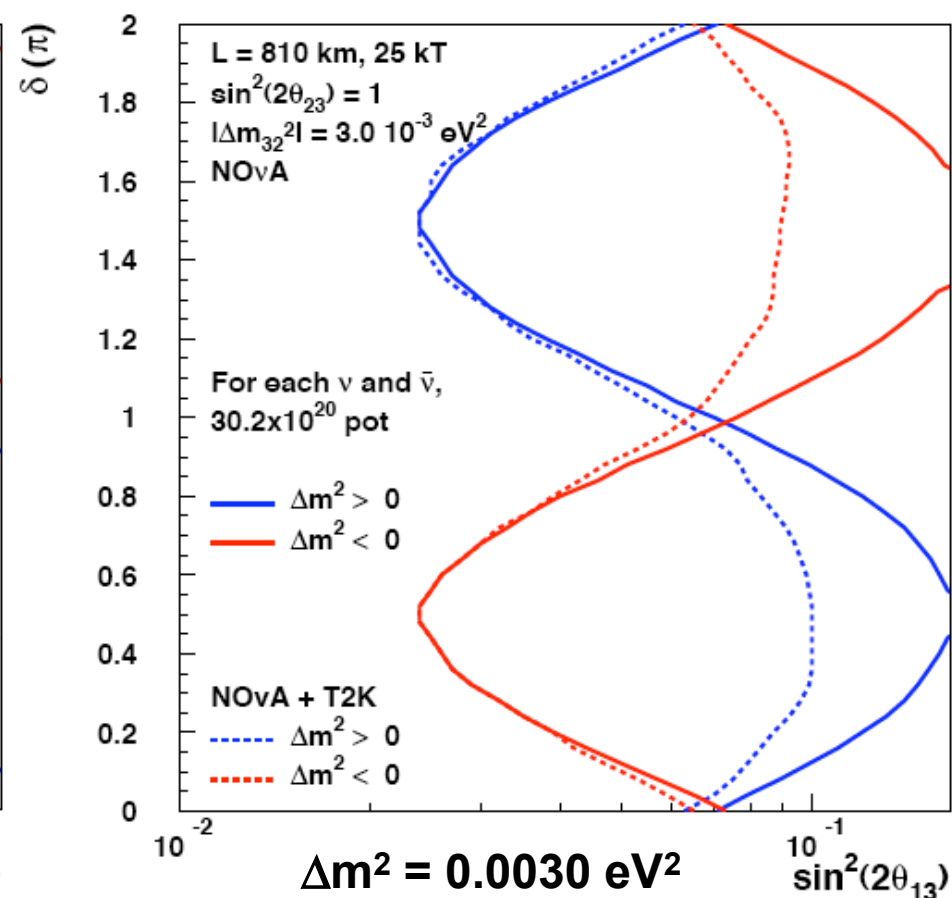


# Combining NOvA and T2K

95% CL Resolution of the Mass Hierarchy



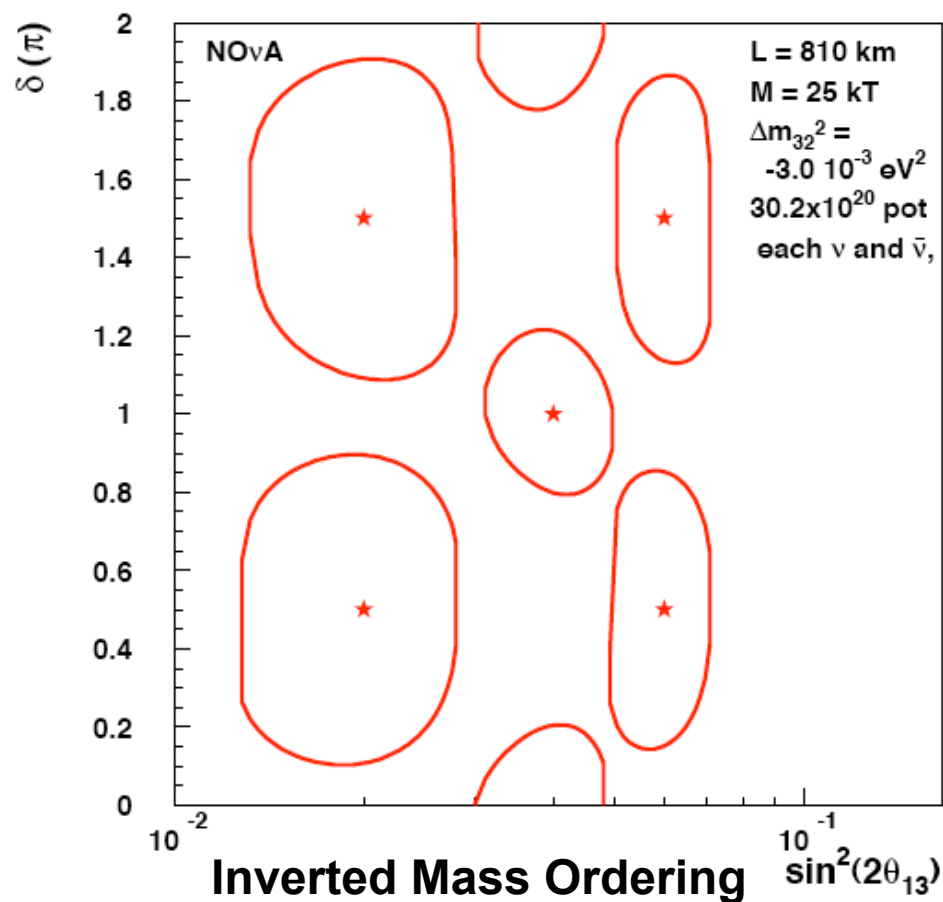
95% CL Resolution of the Mass Hierarchy



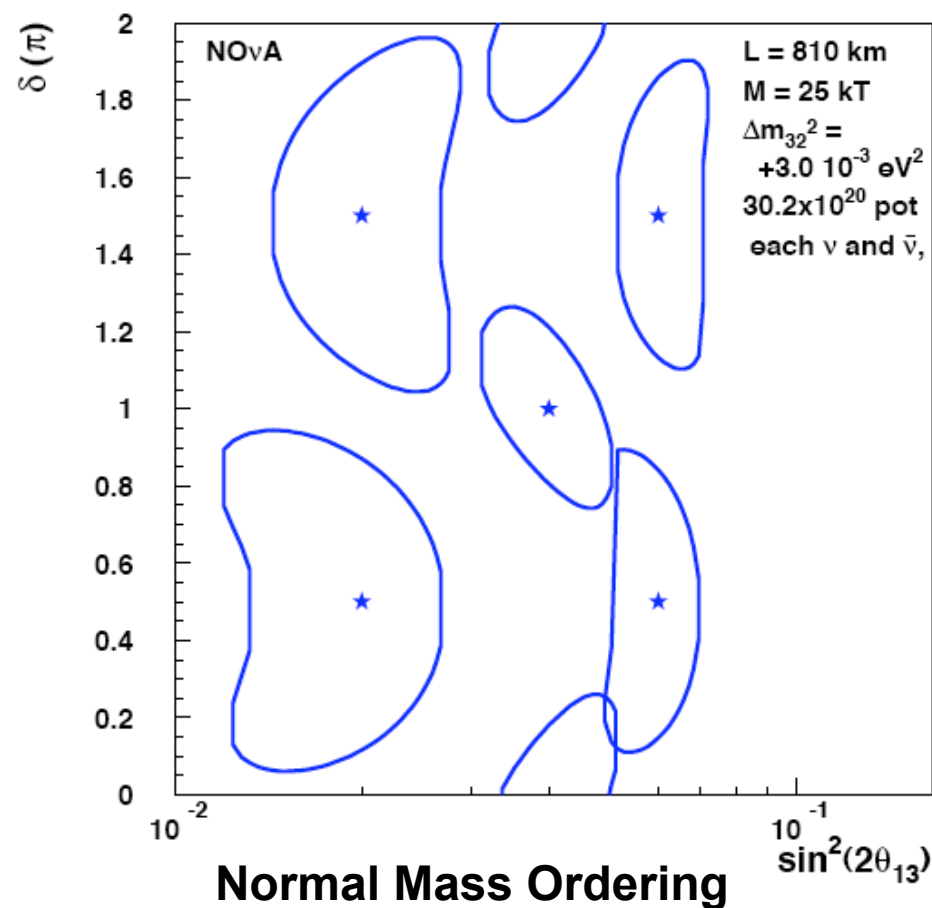


# $\delta$ vs. $\sin^2(2\theta_{13})$ Contours: Normal vs. Inverted Mass

1  $\sigma$  Contours for Starred Points



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# Plan for a MiniBooNE Result?

- **The MiniBooNE results will be reported sometime this summer. There are 3 possibilities.**
  - A negative result
  - A positive result
  - An inconclusive result
- **Independent of the physics, I think one of the last two is a strong possibility. MiniBooNE is a difficult experiment:**
  - Looking for a small effect
  - Only one detector
  - Incomplete understanding of the underlying particle production and neutrino interactions
  - Limited control of systematics
- **NOvA needs think of how either of the last two would affect its plans.**